CLAIMS

What is claimed is:

1.   A method employed by a multi-user receiver to adaptively detect multi-user symbols, said multi-user symbols being subject to impairments occurring in a radio channel which impairments comprise inter-cell interference (ICI), an effective white Gaussian noise, multiple access interference (MAI) and inter-symbol interference (ISI), comprising:

a)   employing a novel Markov Chain Monte Carlo (MCMC) procedure using a Gibbs sampler to adaptively detect the multi-user symbols responsive to the unknown channel responses.

2.   The method of claim 1 further comprising:

a)   employing maximum a posteriori probability (MAP) estimations obtained by a turbo decoder.

3.   The method of claim 2 further comprising:

a)   exchanging extrinsic information with the turbo decoder to successively refine the performance.

4.   The method of claim 1 wherein the received symbols are communicated in CDMA.

5.   The method of claim 1 wherein adaptive Bayesian multi-user detector and turbo decoder are performed on high speed downlink packet access (HSDPA) in a time division duplex (TDD) system.

6.   The method of claim 1 wherein the turbo decoding function comprises:

a)   deinterleaving a difference between a multi-user estimate and an interleaved quantity;

b) turbo decoding the de-interleaved quantity;

c) subtracting from the decoded quantity the deinterleaved quantity; and

d) subtracting the interleaved quantity from the multi-user estimate.

7. The method of claim 6 wherein the result from step (i) is employed to successively refine the multi-user estimate.

8. An apparatus employed by a multi-user receiver to adaptively detect multi-user symbols, said multi-user symbols being subject to impairments occurring in a radio channel which impairments comprise inter-cell interference (ICI), and effective white Gaussian noise, multiple access interference (MAI) and inter-symbol interference (ISI), comprising:

employing a novel Markov Chain Monte Carlo (MCMC) procedure using a Gibbs sampler to adaptively detect the multi-user symbols responsive to the unknown channel responses.

9. The apparatus of claim 8, further comprising:

a turbo decoder having means employing maximum a posteriori probability (MAP) estimations.

10. The apparatus of claim 9, further comprising:

means for exchanging extrinsic information with the turbo decoder to successively refine the performance.

11. The apparatus of claim 8 further comprising means for receiving said symbols in CDMA.

12. The apparatus of claim 8 employing an adaptive Bayesian multi-user detector and said turbo decoder for operating in high speed downlink packet access (HSDPA) in a time division duplex (TDD) system.

13. The apparatus of claim 8 wherein the turbo decoder comprises:

means for deinterleaving a difference between a multi-user estimate and an interleaved quantity;

means for turbo decoding the de-interleaved quantity;

first means for subtracting from the decoded quantity the deinterleaved quantity; and

second means for subtracting the interleaved quantity from the multi-user estimate.

14. The apparatus of claim 13 further comprising means for employing an output of said second subtracting means to refine the multi-user estimate.

15. Apparatus for adaptively detecting multi-user symbols, comprising:

an adaptive Bayesian multi-user detector;

an interleaver;

a deinterleaver;

a turbo decoder;

a first summing circuit for subtracting an output of the interleaver from an output of the detector;

said deinterleaver having an input receiving an output of the first summing circuit and output coupled to an input of said turbo decoder;

a second summing circuit for subtracting an output of said deinterleaver from said turbo decoder;

said interleaver having an input receiving an output of said second summing circuit; and

the output of said interleaving being further coupled to an input of said detector for refining the output of said detector.

16.   The apparatus of claim 15 wherein said turbo decoder comprises:

means employing a novel Markov Chain Monte Carlo (MCMC) procedure using a Gibbs Sampler to adaptively detect the multi-user symbols responsive to the unknown channel responses.